THERMOLIER

A GRINNELL DEVELOPMENT IN UNIT HEATERS

FOUNDED 1850

GRINNELL COMPANY
INC.

GRINNELL COMPANY, INC.

EXECUTIVE OFFICES
PROVIDENCE, R. I.

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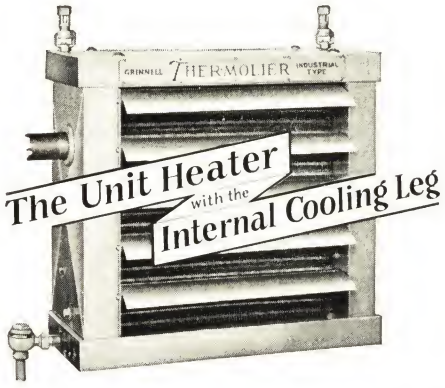
THERMOLIER

A development based upon 50 years' experience in heating. Thermolier has fourteen outstanding features, dictated by practical engineering knowledge.

● Underlying Principles

The old method of heating industrial and commercial buildings by pipe coils and cast iron radiation fails to secure ideal, uniform comfort on cold days and mild days, with just the heat you want, when and where you want it. The new method of unit heating meets these desired ends in a revolutionary manner and at much less cost than automatic controls on steam systems or careful central control on hot water systems.



Unit heating produces a large amount of heat in a small amount of space and distributes this heat by rapid air circulation. Steam or hot water is always in the radiating elements, so the amount of heat diffused depends entirely on whether or not the fan is running. It further provides almost instantaneous heat.

● Economy

The principle of unit heating is so revolutionary that it successfully meets all five basic elements which go to make up heating cost.

These determining factors in the choice of all heating equipments are:

1. Minimum Initial Investment
2. Minimum Expense of Operation
3. Minimum Maintenance
4. Minimum Depreciation
5. Maximum Adaptability

● Installation

As compared with direct steam a unit heater system requires only one-eighth the number of valves, traps and accessories.

Requires only one-eighth the number of elbows, tees, unions and other fittings.

Requires only one-fifth the amount of pipe for supply and return lines.

Requires only one-fifteenth of the weight in radiating elements.

● A More Efficient and Rugged Unit

In the Thermolier, GRINNELL COMPANY, INC., believes it is offering a development of unit heaters so ruggedly built and so conservatively engineered as to make this revolutionary heater principle more effective, and of wider practical application.

A unit weighing approximately 200 lbs. does the work of more than 5000 lbs. of cast iron radiation and occupies a space of less than 8 cu. ft. Being hung from ceilings, columns or beams, it adds to the comfort of operators, and uses no space needed for machinery and equipment.

● Types and Models

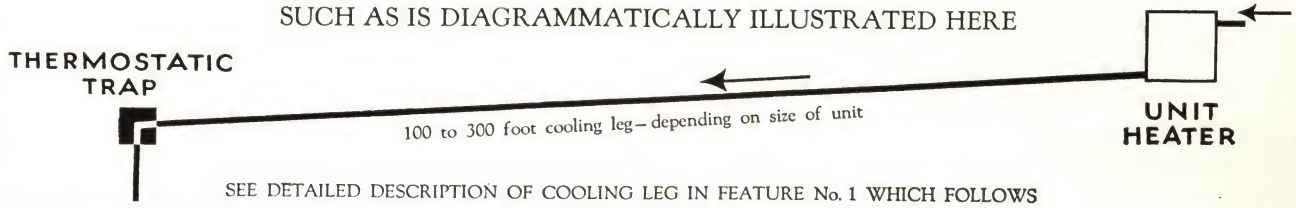
Thermolier is made in 16 models (or capacities). The Industrial Type is encased in a polished copper housing. The Factory Type is encased in a housing of steel and is finished in gray duco.

Thermoliers are made in regular and "A" models (the latter being a unit of less heating surface and lower final temperature).

THE INTERNAL COOLING LEG DISTINGUISHES THERMOLIER FROM ALL OTHER UNIT HEATERS

The importance of this feature can not be over-emphasized. It takes the place of from 100 to 300 feet of external cooling leg piping, according to size of Thermolier, and thus allows the use of a Thermostatic trap attached to the unit. No other unit heater has this patented Grinnell feature.

THE THERMOLIER INTERNAL COOLING LEG ACCOMPLISHES A RESULT SUCH AS IS DIAGRAMMATICALLY ILLUSTRATED HERE



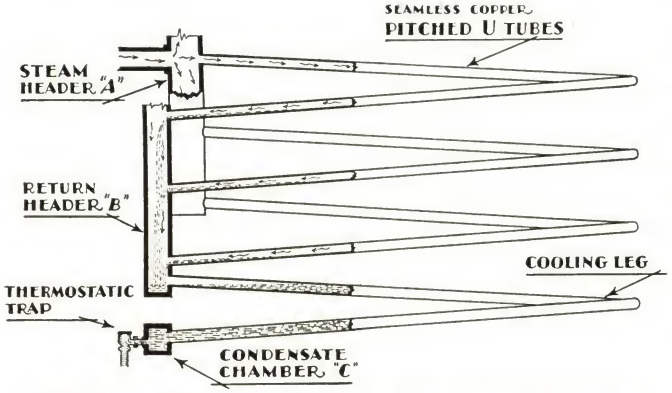
SEE DETAILED DESCRIPTION OF COOLING LEG IN FEATURE No. 1 WHICH FOLLOWS

THE "14" FEATURES WHICH 50 YEARS' HEATING EXPERIENCE BUILT INTO THERMOLIER

1 *A Cooling Leg feature so simple, practical, and valuable that engineers and contractors alike realize its importance.*

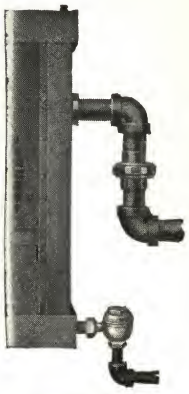
Unique Header Construction

Steam is delivered into chamber "A" of the header and circulates from there through the pitched U tubes, carrying its condensation with it into chamber "B." By partitioning off the lower tubes at the bottom of the steam supply chamber "A," these tubes carry all condensation from chamber "B" into drain chamber "C." In passage of this condensation through these tubes, the air from the fan is rapidly carrying off heat just as it does in the rest of the unit. The result is that these lower tubes form an efficient internal cooling leg, integral with the unit. The actual cooling effect of this construction is equal to a run of more than 100 ft. of the ordinary, exterior cooling leg piping.



This Drawing Illustrates the Function of the Internal Cooling Leg

2 Due to the efficient functioning of the internal cooling leg, it is practical with the Grinnell Thermolier to make an exceedingly close connection of the return trap, namely, to attach a thermostatic trap directly to the return outlet of the Unit, as indicated in the accompanying illustration.



Simple Piping Connections

The condensation coming from the unit is cool enough so that a thermostatic trap can be used, which operates continuously even when the unit is working at maximum capacity for long periods.

This feature, combined with the fact that the steam supply connection is at the same end of the unit, makes for compactness and neatness in the piping connections and effects important economies both in labor and materials.

3 These "Adjustable Swivel Couplings," here illustrated, were developed for hanging Grinnell Thermoliers and are an integral part of each unit. The swivel is loose in the socket, which allows vibration from building or machinery to be taken up in the hanger and not transmitted to the unit.

Easily Adjustable Swivel Socket Hangers

THE "14" THERMOLIER FEATURES

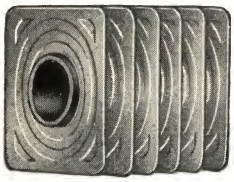
4 This shows cut-through section emphasizing two other practical engineering features. At left is shown gasket bearing surface into which is heavily bolted a gasket of the very materials used in steam piping work for the highest pressures and temperatures.

Perfect Expansion Bends Take Up All Strains

At right are shown the perfect expansion bends—a part of every tube.

These bends absorb contraction and expansion strains.

5 The steam container is made of ⅜-in. seamless copper tubing, which under actual bursting tests has withstood an internal pressure of 9500 lbs. Stamped fins ⅞-in. square, slightly corrugated for stiffness, are attached uniformly to this tubing.



⅜-in. Seamless Copper Tubing—Brass Fins

Square brass fins provide 24% more area than round fins occupying the same space.

This accounts for the large amount of heat obtained from the small frontal area of Thermolier.

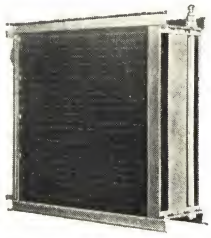
6 No solder whatever is used for strength in Thermolier assembly. The deep, tight fitting collars on the fins provide ample support and large metal contacts for rapid heat transfer from tubes to fins. (See cut under No. 8.)

7 Of the total heating surface, 89% is provided in *vertical* fins, which will not catch or hold dirt. The remaining 11% of the heating surface consists of the round, horizontal tubes. Only a small area at the top of the tubes could conceivably catch dirt. There is absolutely no flat horizontal surface in the unit.

8 Each tube in the Grinnell Thermolier is expanded into a cast iron tube sheet ½-in. thick, the finished job being practically a rolled joint. Obviously with this construction the steam pressures which the heating element of Thermolier will withstand is limited only by the weight of the cast iron header. The standard unit is built for 125 lbs. working steam pressure.

Tubes Expanded Into Cast Iron Tube Sheet

9 The pitch of each tube is not less than $\frac{3}{16}$ in. per ft., which provides perfect and rapid drainage of condensation, thus increasing heating efficiency and doing away with the possibility of noisy and destructive water hammer on account of accumulated condensation.



Frame with Hanger

10 Thermolier is constructed with great ruggedness. In addition to the rugged framework, two heavy hanger rods extend through and become an integral part of the completed frame.

11 Thermoliers may be hung by more than a dozen methods through the use of Grinnell Adjustable Hangers in connection with the Adjustable Swivel Couplings used on Thermolier. Grinnell shows in its Hanger Catalogue the full line of adjustable hangers.

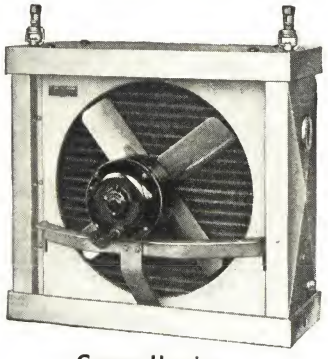
12 The louvers are made of heavy pure copper for Industrial Type, or heavy steel finished in gray duco for Factory Type. Each louver may be adjusted independently of the other, and may be set permanently into place, simply by tightening the brass nuts.

Independently Adjustable Louvers

13 Thermolier has a motor fully enclosed to keep out dirt and moisture. It is equipped with ball bearings to reduce maintenance and upkeep. Motor is especially wound to provide high efficiency and a high power factor.

The direct-connected fan has a heavy hub and aluminum blades. The mounting for motor and fan is a heavy angle iron frame, reinforced by a sturdy, supporting leg. (See cut under No. 14.)

14 Rear view of Industrial Type Unit showing how the copper housing covers the whole unit, protecting the heavy steel framework from moisture. Factory Type Unit has a steel housing of neat appearance finished in gray duco.



Copper Housing

The fourteen features illustrated and briefly described are vital and important only when built into a working unit by a company of unquestioned integrity and responsibility. Of greater significance even than these features is the fact that Thermolier is sponsored by Grinnell Company, with its half century of heating experience and its reputation as one of the country's leading manufacturers and distributors of cast iron fittings, adjustable pipe hangers, fabricated piping, and general piping supplies.

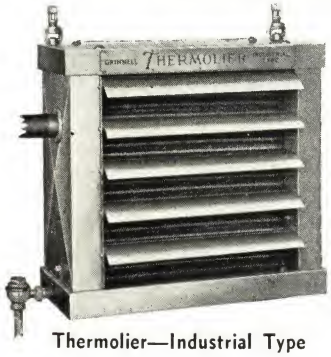
TYPES, MODELS AND DIMENSIONS

Industrial Type

Sixteen Models (See Dimension Table).

Available with polished copper or chrome plated housing. Velocity nozzles have same finish. Suitable for use in mercantile buildings, manufacturing buildings, factory offices, stores, etc., where the best in appearance is desired.

Thermolier without Housing is available in all model numbers as listed below. Usually used to build into special housing, duct or wall.



Thermolier—Industrial Type

LIST PRICES

Model No.	100 200	100A 200A	300 400	300A 400A
Copper housing	$100	$ 90	$150	$135
Chrome plated	110	100	160	145

Model No.	600 800	600A 800A	1200 1600	1200A 1600A
Copper housing	$200	$180	$385	$345
Chrome plated	215	195	405	365

Portable Type

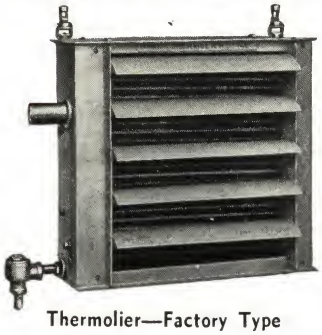
Portable Type in steel cage on swivel rollers is available in Model 800 only.

List price, $260.00; approximate net weight, 360 lb.; shipping weight, 485 lb.

Factory Type

Sixteen Models (See List Price Table).

Available with steel housing, gray Duco finish. Slightly less expensive than copper housing unit and for use where appearance is not of paramount importance. Velocity nozzles have same finish. All essential dimensions are same as listed for Industrial Type in table below.



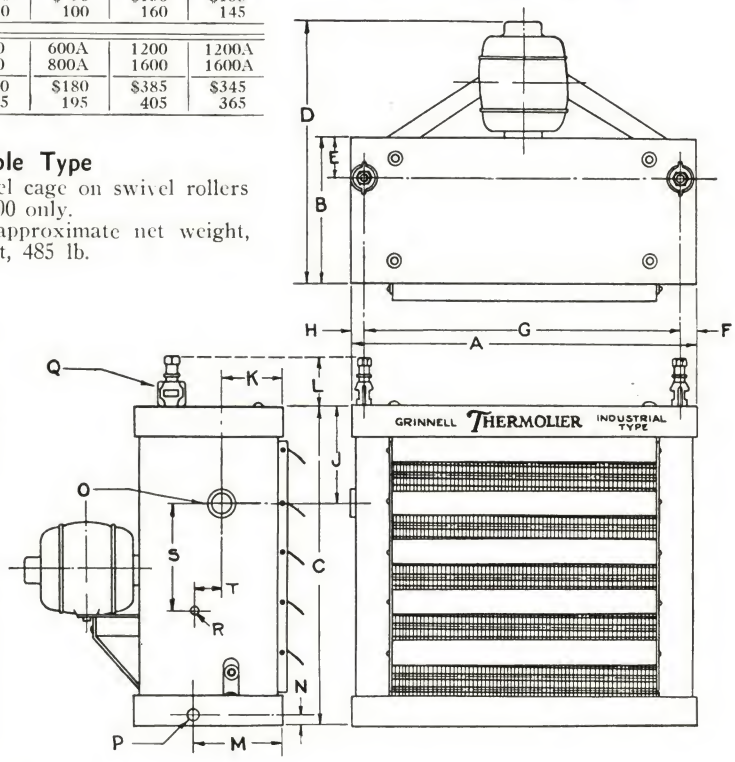
Thermolier—Factory Type

LIST PRICES*

Model No.	Price
100 —200	$ 94
100A—200A	84
300 —400	142
300A—400A	127
600 —800	190
600A—800A	170
1200 —1600	365
1200A—1600A	325

*Steel housing.

125 Lbs. Maximum Working Steam Pressure



DIMENSIONS AND WEIGHTS OF INDUSTRIAL TYPE

Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	O Supply	P Return	Q	R	S	T	No. of Louvers	Weight, lb. Net	Weight, lb. Ship.
100, 100A, 200, 200A	14 1/4	8 1/2	11 3/4	*15	2 3/16	15/16	12 5/8	11/16	2 3/4	3 1/4	2 5/8	5 11/16	13/16	1 1/4	1/2	†3/8	3/8	4 1/2	2 1/16	4	55	70
300, 300A, 400, 400A	21 1/8	10 7/16	18 7/16	*17	2 15/16	1	19 1/8	1	3 3/4	4 1/16	3 1/8	6 5/8	13/16	1 1/2	3/4	†1/2	3/8	7 3/16	2 3/8	4	105	130
600, 600A, 800, 800A	27 3/4	11 7/8	25 1/2	*21	3 7/8	1 11/16	24 7/8	1 3/16	7 5/8	4 7/8	4	6 7/8	1 11/16	2	‡1	†5/8	3/8	10 7/8	2	5	190	250
1200, 1200A 1600, 1600A	36 1/2	12 3/4	32 5/8	*25	4 1/4	1 1/2	33 11/16	1 1/4	9 7/16	5 3/16	5 7/16	6 7/8	1 1/4	2 1/2	‡1 1/4	†7/8	3/8	12 5/8	1 3/4	6	400	550

All dimensions given in inches. Air vent "R" is tapped 3/8 in., but can be bushed as required. *This dimension varies slightly with different motors. †Adjustable swivel coupling (furnished with Thermolier) tapped standard bolt thread. ‡Outlets bushed to pipe size next smaller than indicated in table.

CONTROLLING THERMOLIER UNITS

● Manual Control

D-C. up to 440 Volts or Single Phase A-C. up to 220 Volts. Three Phase A-C. up to 550 Volts.

It is usually preferable to have special circuits controlling the Units only.

As many Thermoliers as desired may be connected into one manually controlled circuit. It is, however, recommended that at least each room or section be on a separate circuit.

● Automatic Control

The number of units to be controlled by a single Thermostat, either directly or with Automatic Starter or Magnetic Switch, should be governed by conditions in the area to be heated.

Typical Wiring Diagrams with explanatory notes are included in the Thermolier Data Book, copy of which will be mailed on request.

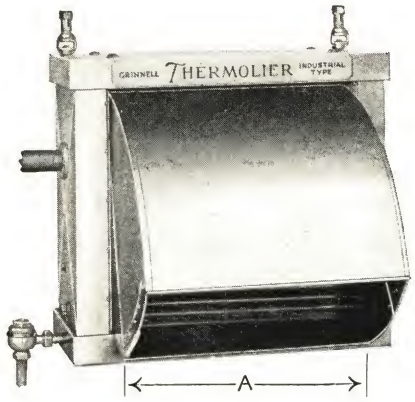
● Duotherm Control

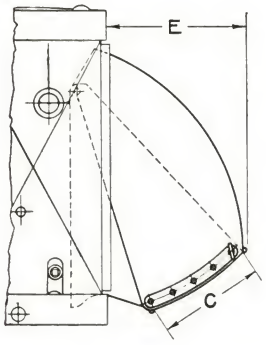
The Grinnell Duotherm Control is a device for regulating room temperatures where unit heating systems are installed. A high temperature is automatically maintained when required, and a low temperature during idle hours such as at night and on holidays. This wide range of high and low temperatures cannot be secured by the ordinary single thermostat control. Bulletin No. A-3 giving a detailed analysis of the economies to be had by its use, will be mailed upon request.

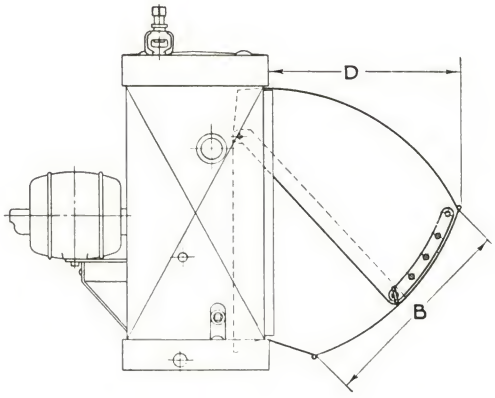
● Remote Control

The most important economies to be gained by its use are in the remote control of temperatures throughout large plants. When so used, the temperatures throughout the whole plant are under the control of one responsible individual in the boiler room or any other convenient place.

APPLICATION OF VELOCITY NOZZLE TO THERMOLIER







LIST PRICES AND DIMENSIONS

Thermolier Model No.	100—100A 200—200A	300—300A 400—400A	600—600A 800—800A	1200—1200A 1600—1600A
*List price—velocity nozzle only—Copper	$12.00	$12.00	$15.00	$25.00
—Chrome plated	15.00	15.00	20.00	32.00
—Steel duco finish	8.00	8.00	10.00	15.00
*Note.—List prices shown include adjustment for omission of louvers.				
A Length of discharge opening	9¼ in.	14¾ in.	20¾ in.	28 in.
B Maximum width of discharge opening	8⅜ in.	12¾ in.	16 15/16 in.	23 in.
C Minimum width of discharge opening	3⅞ in.	6¾ in.	8 7/16 in.	10½ in.
D Maximum overhang	7 in.	11 in.	15¼ in.	22½ in.
E Minimum overhang	5½ in.	8 in.	10¾ in.	14½ in.

VELOCITY NOZZLE EFFECT PERCENTAGES

	Normal capacities without velocity nozzle—5 Lb. steam—60° air			Capacities with velocity nozzles											
				Percentage of normal B. T. U. delivery with different openings of nozzle						Percentage of normal discharge velocity with different openings of nozzle					
Model	B. T. U. per hr.	Discharge opening	Discharge velocity	Smallest	2nd	3rd	4th	5th	Largest	Smallest	2nd	3rd	4th	5th	Largest
200	32,900	.58 Sq. Ft.	655 F.P.M.	82%	93%	96%	98%	.....	.....	188%	160%	136%	122%	.....	.....
400	110,800	1.53 Sq. Ft.	949 F.P.M.	76%	86%	92%	96%	.....	.....	180%	146%	124%	112%	.....	.....
800	199,100	2.95 Sq. Ft.	773 F.P.M.	85%	92%	96%	98%	99%	.....	202%	168%	142%	127%	114%	.....
1600	388,000	5.25 Sq. Ft.	923 F.P.M.	85%	90%	93%	96%	97%	99%	186%	166%	146%	128%	118%	109%

FURTHER DATA AND INFORMATION

Capacity Tables

Complete in the Thermolier Data Book which will be sent on request, or by telephoning our nearest branch office.

Electric Wiring Diagrams

Manual, Automatic and Duotherm Control, with descriptions and list prices, are in our Thermolier Data Book.

Motor Specifications

Send for Thermolier Data Book for Ratings, Brake H.P., Speed and Prices of Stock Motors (constant speed). Also for characteristics and models of multi-speed motors for special orders.

Piping Materials

Typical connections (see page 10)

For Schedules of Materials write or telephone nearest Grinnell office for Thermolier Data Book.

Adjustable Hangers

Detailed schedules for ordering are given in the Thermolier Data Book. See also Grinnell Pipe Hanger Catalogue in this edition of SWEET'S ARCHITECTURAL CATALOGUES for Figs. No. 225, 226, 154, 155, 281, 202.

CAPACITY TABLES FOR MODELS 100-100A-200-200A

*See Note below

Model 100

C.F.M. (70° Vol.) 221 at 60° F. Entering Air Temperature

Motor: R.P.M., 1150 Brake H.P., .01

Temp. of entering air, °F.	Steam Press. 2 Lb. per Sq. In. Gage (219° F.)			Steam Press. 5 Lb. per Sq. In. Gage (228° F.)			Steam Press. 25 Lb. per Sq. In. Gage (267° F.)			Steam Press. 100 Lb. per Sq. In. Gage (338° F.)		
	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour
—20	39,700	119	41	41,000	125	43	47,400	148	51	59,300	190	67
0	35,100	129	36	36,400	134	38	42,800	158	46	54,200	200	62
20	30,800	139	32	32,100	144	34	38,400	167	42	49,400	210	56
40	26,900	148	28	28,200	153	29	34,200	177	37	44,900	220	51
60	23,200	157	24	24,500	162	26	30,300	186	33	40,700	230	46
70	21,400	161	22	22,700	166	24	28,400	191	31	38,700	234	44
80	19,700	165	20	21,000	171	22	26,600	195	29	36,700	239	42
100	16,500	174	17	17,700	179	18	23,100	204	25	33,000	248	37
120	13,300	182	14	14,500	187	15	19,700	212	21	29,400	257	33
	†Air delivery, 257. ‡Air velocity, 437.			†Air delivery, 260. ‡Air velocity, 441.			†Air delivery, 269. ‡Air velocity, 458.			†Air delivery, 288. ‡Air velocity, 488.		

Model 100A

C.F.M. (70° Vol.) 261 at 60° F. Entering Air Temperature

Motor: R.P.M., 1150 Brake H.P., .01

Temp. of entering air, °F.	Steam Press. 2 Lb. per Sq. In. Gage (219° F.)			Steam Press. 5 Lb. per Sq. In. Gage (228° F.)			Steam Press. 25 Lb. per Sq. In. Gage (267° F.)			Steam Press. 100 Lb. per Sq. In. Gage (338° F.)		
	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour
—20	28,900	67	30	29,900	74	31	34,500	84	37	43,000	109	49
0	25,600	80	26	26,600	83	28	31,200	98	34	39,800	124	45
20	22,400	94	23	23,500	97	25	28,100	112	30	36,400	139	41
40	19,900	107	20	20,700	110	22	25,000	125	27	33,200	153	38
60	17,200	121	18	18,000	124	19	22,200	139	24	30,100	167	34
70	15,900	127	16	16,700	130	17	20,900	146	23	28,700	173	32
80	14,600	133	15	15,400	137	16	19,600	152	21	27,200	180	31
100	12,200	146	13	13,000	149	14	17,100	165	19	24,600	193	28
120	9,800	159	10	10,700	162	11	14,700	178	16	22,000	207	25
	†Air delivery, 286. ‡Air velocity, 485.			†Air delivery, 288. ‡Air velocity, 488.			†Air delivery, 295. ‡Air velocity, 500.			†Air delivery, 309. ‡Air velocity, 524.		

Model 200

C.F.M. (70° Vol.) 335 at 60° F. Entering Air Temperature

Motor: R.P.M., 1750 Brake H.P., .03

Temp. of entering air, °F.	Steam Press. 2 Lb. per Sq. In. Gage (219° F.)			Steam Press. 5 Lb. per Sq. In. Gage (228° F.)			Steam Press. 25 Lb. per Sq. In. Gage (267° F.)			Steam Press. 100 Lb. per Sq. In. Gage (338° F.)		
	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour
—20	52,200	105	55	54,300	107	57	63,100	128	68	78,700	164	90
0	46,700	114	48	49,600	118	51	57,100	139	62	72,300	176	82
20	41,300	125	43	43,100	129	45	51,300	150	56	66,100	187	75
40	36,100	136	37	37,900	140	39	45,900	161	50	60,200	199	69
60	31,200	146	32	32,900	150	34	40,700	172	44	54,700	211	62
70	28,900	152	30	30,500	156	32	38,300	177	41	52,100	216	59
80	26,600	156	28	28,200	161	29	36,000	182	39	49,500	222	58
100	22,200	166	23	23,700	171	25	31,300	192	34	44,500	232	51
120	18,000	175	19	19,400	180	20	26,900	202	29	39,800	242	45
	†Air delivery, 383. ‡Air velocity, 650.			†Air delivery, 386. ‡Air velocity, 655.			†Air delivery, 400. ‡Air velocity, 678.			†Air delivery, 424. ‡Air velocity, 720.		

Model 200A

C.F.M. (70° Vol.) 408 at 60° F. Entering Air Temperature

Motor: R.P.M., 1750 Brake H.P., .03

Temp. of entering air, °F.	Steam Press. 2 Lb. per Sq. In. Gage (219° F.)			Steam Press. 5 Lb. per Sq. In. Gage (228° F.)			Steam Press. 25 Lb. per Sq. In. Gage (267° F.)			Steam Press. 100 Lb. per Sq. In. Gage (338° F.)		
	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour
—20	37,600	52	39	39,000	55	40	44,300	66	49	57,700	86	63
0	33,600	67	35	34,900	70	36	40,900	82	44	51,500	103	59
20	29,800	82	31	31,000	85	32	37,900	97	40	47,500	119	54
40	26,200	97	27	27,400	100	29	33,300	112	36	43,600	135	50
60	22,700	111	23	24,000	114	25	29,600	127	32	39,900	150	45
70	21,100	119	22	22,300	121	23	28,000	134	30	38,000	158	43
80	19,400	126	20	20,600	129	22	26,200	142	28	36,200	165	41
100	16,300	140	17	17,500	143	18	22,800	156	25	32,500	179	37
120	13,200	153	14	14,400	156	15	19,500	170	21	29,200	194	33
	†Air delivery, 440. ‡Air velocity, 746.			†Air delivery, 442. ‡Air velocity, 749.			†Air delivery, 452. ‡Air velocity, 766.			†Air delivery, 469. ‡Air velocity, 796.		

*Data sheets covering all working pressures are available upon request.
The Grinnell Thermolier is tested and rated in accordance with rules of the Industrial Unit Heater Manufacturers Association adopted Jan. 1930.
†Air delivery in cu. ft. per min. based on 60° F. entering air temperature.
‡Air velocity at exit in linear ft. per min. based on 60° F. entering air temperature and taken with louvers in wide open position; with louvers in 45° position, velocity increases approximately 18%.
Maximum working steam pressure, 125 lb.

CAPACITY TABLES FOR MODELS 300-300A-400-400A

*See Note Below

Model 300

C.F.M. (70° Vol.) 817 at 60° F. Entering Air Temperature

Motor: R.P.M., 1150 Brake H.P., .04

Temp. of entering air, °F.	Steam Press. 2 Lb. per Sq. In. Gage (219° F.)			Steam Press. 5 Lb. per Sq. In. Gage (228° F.)			Steam Press. 25 Lb. per Sq. In. Gage (267° F.)			Steam Press. 100 Lb. per Sq. In. Gage (338° F.)		
	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour
—20	132,000	107	149	136,900	112	142	158,200	133	172	208,200	170	226
0	117,800	118	122	122,500	122	128	143,600	144	156	182,000	181	207
20	103,600	128	108	108,100	133	113	129,000	154	140	165,800	193	189
40	90,100	138	94	95,000	143	99	115,000	164	125	150,800	204	172
60	77,700	148	81	82,300	153	86	101,900	175	110	136,500	215	155
70	71,900	153	74	76,100	158	80	95,500	180	103	130,000	220	147
80	66,000	158	68	70,400	163	74	89,400	185	97	123,200	225	140
100	55,500	167	57	59,000	172	62	77,900	194	84	110,500	234	126
120	44,400	176	46	48,600	181	51	66,500	204	72	98,700	244	112
	†Air delivery, 938. ‡Air velocity, 620.			†Air delivery, 945. ‡Air velocity, 625.			†Air delivery, 978. ‡Air velocity, 647.			†Air delivery, 1039. ‡Air velocity, 687.		

Model 300A

C.F.M. (70° Vol.) 954 at 60° F. Entering Air Temperature

Motor: R.P.M., 1150 Brake H.P., .04

Temp. of entering air, °F.	Steam Press. 2 Lb. per Sq. In. Gage (219° F.)			Steam Press. 5 Lb. per Sq. In. Gage (228° F.)			Steam Press. 25 Lb. per Sq. In. Gage (267° F.)			Steam Press. 100 Lb. per Sq. In. Gage (338° F.)		
	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour
—20	90,500	54	93	93,600	57	98	108,000	69	117	136,000	92	155
0	80,500	69	83	84,000	72	87	98,500	84	106	125,000	107	142
20	70,500	83	74	74,500	86	78	88,500	99	96	114,200	122	130
40	61,500	98	65	65,400	101	68	79,000	114	86	104,000	137	118
60	53,300	112	56	56,900	115	59	70,000	128	76	94,600	151	107
70	49,200	119	52	52,900	122	55	66,000	135	72	90,000	159	102
80	45,500	126	47	48,800	129	51	61,500	142	67	85,500	166	97
100	38,100	140	40	41,200	143	43	54,000	157	58	76,800	180	88
120	31,000	154	32	34,000	153	35	46,500	170	50	68,800	194	78
	†Air delivery, 1030. ‡Air velocity, 682.			†Air delivery, 1035. ‡Air velocity, 685.			†Air delivery, 1057. ‡Air velocity, 701.			†Air delivery, 1100. ‡Air velocity, 728.		

Model 400

C.F.M. (70° Vol.) 1267 at 60° F. Entering Air Temperature

Motor: R.P.M., 1750 Brake H.P., .16

Temp. of entering air, °F.	Steam Press. 2 Lb. per Sq. In. Gage (219° F.)			Steam Press. 5 Lb. per Sq. In. Gage (228° F.)			Steam Press. 25 Lb. per Sq. In. Gage (267° F.)			Steam Press. 100 Lb. per Sq. In. Gage (338° F.)		
	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour
—20	171,800	86	177	177,900	90	185	207,000	108	225	258,000	141	293
0	154,500	99	160	160,600	103	167	189,000	121	204	239,000	154	272
20	137,200	112	142	143,300	116	149	171,000	135	185	220,000	168	250
40	120,600	124	125	127,000	129	132	153,000	147	166	201,400	181	229
60	104,800	137	108	110,800	141	115	136,500	160	148	183,600	194	209
70	97,400	142	100	103,000	147	107	128,600	166	139	175,100	200	199
80	89,600	148	93	95,100	152	99	120,900	172	131	167,000	206	190
100	75,000	159	78	80,100	164	84	106,500	183	115	150,600	218	171
120	60,000	170	63	66,100	174	69	92,300	194	99	135,000	230	153
	†Air delivery, 1424. ‡Air velocity, 942.			†Air delivery, 1436. ‡Air velocity, 949.			†Air delivery, 1481. ‡Air velocity, 980.			†Air delivery, 1563. ‡Air velocity, 1033.		

Model 400A

C.F.M. (70° Vol.) 1475 at 60° F. Entering Air Temperature

Motor: R.P.M., 1750 Brake H.P., .16

Temp. of entering air, °F.	Steam Press. 2 Lb. per Sq. In. Gage (219° F.)			Steam Press. 5 Lb. per Sq. In. Gage (228° F.)			Steam Press. 25 Lb. per Sq. In. Gage (267° F.)			Steam Press. 100 Lb. per Sq. In. Gage (338° F.)		
	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour
—20	113,600	41	118	117,000	43	122	136,500	52	148	170,500	71	193
0	102,000	56	106	106,100	59	111	124,700	69	135	158,000	87	179
20	90,700	72	94	94,700	75	99	113,000	85	122	145,500	104	165
40	79,700	88	83	83,700	91	88	101,700	101	110	133,600	120	152
60	69,400	104	72	73,400	106	77	91,000	117	98	122,100	136	139
70	64,500	111	67	68,400	114	72	85,700	125	93	116,500	145	133
80	59,600	119	62	63,500	121	66	80,500	132	87	111,000	152	126
100	50,000	134	52	53,900	136	56	70,600	148	77	100,500	168	115
120	41,000	148	42	44,700	151	46	61,000	162	66	90,500	183	103
	†Air delivery, 1566. ‡Air velocity, 1039.			†Air delivery, 1574. ‡Air velocity, 1043.			†Air delivery, 1606. ‡Air velocity, 1064.			† Air delivery, 1661. ‡Air velocity, 1099.		

*Data sheets covering all working pressures are available upon request.
The Grinnell Thermolier is tested and rated in accordance with rules of the Industrial Unit Heater Manufacturers Association adopted Jan. 1930.
†Air delivery in cu. ft. per min. based on 60° F. entering air temperature.
‡Air velocity at exit in linear ft. per min. based on 60° F. entering air temperature and taken with louvers in wide open position; with louvers in 45° position, velocity increases approximately 35%.
Maximum working steam pressure, 125 lb.

CAPACITY TABLES FOR MODELS 600-600A-800-800A

*See Note below

Model 600

C.F.M. (70° Vol.) 1475 at 60° F. Entering Air Temperature

Motor: R.P.M., 850 Brake H.P., .09

Temp. of entering air, °F.	Steam Press. 2 Lb. per Sq. In. Gage (219° F.)			Steam Press. 5 Lb. per Sq. In. Gage (228° F.)			Steam Press. 25 Lb. per Sq. In. Gage (267° F.)			Steam Press. 100 Lb. per Sq. In. Gage (338° F.)		
	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour
—20	248,000	112	256	257,000	117	267	297,500	139	323	372,000	178	424
0	223,000	122	231	231,400	127	240	270,000	149	293	342,000	189	389
20	197,300	132	204	205,800	138	215	242,500	160	263	312,000	200	355
40	174,100	142	180	182,400	147	190	216,000	170	234	284,000	211	323
60	151,600	152	156	159,500	157	166	191,000	180	207	257,000	221	292
70	138,900	156	144	147,100	161	154	179,000	184	194	244,000	226	278
80	126,500	161	132	134,800	166	140	167,500	189	182	232,000	231	264
100	104,500	170	109	112,600	175	117	146,000	198	158	208,000	240	237
120	84,000	179	88	91,500	184	96	125,000	207	136	186,000	250	212
	†Air delivery, 1702. ‡Air velocity, 569.			†Air delivery, 1717. ‡Air velocity, 574.			†Air delivery, 1780. ‡Air velocity, 595.			†Air delivery, 1895. ‡Air velocity, 633.		

Model 600A

C.F.M. (70° Vol.) 1722 at 60° F. Entering Air Temperature

Motor: R.P.M., 850 Brake H.P., .09

Temp. of entering air, °F.	Steam Press. 2 Lb. per Sq. In. Gage (219° F.)			Steam Press. 5 Lb. per Sq. In. Gage (228° F.)			Steam Press. 25 Lb. per Sq. In. Gage (267° F.)			Steam Press. 100 Lb. per Sq. In. Gage (338° F.)		
	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour
—20	163,500	55	169	169,500	57	176	197,000	70	214	245,000	92	278
0	147,000	70	152	153,000	72	159	180,000	85	195	227,000	108	258
20	130,500	85	136	136,500	87	142	163,000	100	176	209,000	123	238
40	115,000	99	120	121,000	102	126	146,000	115	158	191,500	139	219
60	100,000	113	104	105,000	116	110	130,500	130	141	175,000	154	200
70	92,500	121	96	98,000	123	103	123,000	137	133	167,000	161	191
80	85,500	128	89	90,500	131	95	115,500	144	125	159,500	169	182
100	72,000	142	75	77,000	144	81	101,500	158	110	145,000	183	165
120	59,000	156	61	63,000	158	67	88,500	173	95	131,000	198	149
	†Air delivery, 1860. ‡Air velocity, 623.			†Air delivery, 1872. ‡Air velocity, 626.			†Air delivery, 1917. ‡Air velocity, 641.			†Air delivery, 1995. ‡Air velocity, 667.		

Model 800

C.F.M. (70° Vol.) 2016 at 60° F. Entering Air Temperature

Motor: R.P.M., 1150 Brake H.P., .22

Temp. of entering air, °F.	Steam Press. 2 Lb. per Sq. In. Gage (219° F.)			Steam Press. 5 Lb. per Sq. In. Gage (228° F.)			Steam Press. 25 Lb. per Sq. In. Gage (267° F.)			Steam Press. 100 Lb. per Sq. In. Gage (338° F.)		
	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour
—20	306,500	100	315	317,000	104	330	368,500	124	399	460,500	159	523
0	276,100	111	285	282,200	115	299	335,000	136	363	424,500	172	482
20	245,900	122	255	257,000	127	267	301,500	147	326	388,500	184	441
40	216,200	133	224	227,100	138	237	269,000	158	292	354,000	196	402
60	189,200	144	196	199,100	148	207	238,500	169	259	321,000	207	365
70	173,500	149	180	183,800	154	192	224,000	175	243	306,000	212	347
80	158,800	154	164	168,600	159	176	210,000	180	228	290,500	218	330
100	130,700	164	135	141,200	169	147	183,000	190	198	261,000	229	297
120	104,500	174	109	114,500	178	119	157,000	200	170	233,000	239	265
	†Air delivery, 2298. ‡Air velocity, 768.			†Air delivery, 2315. ‡Air velocity, 773.			†Air delivery, 2393. ‡Air velocity, 800.			†Air delivery, 2535. ‡Air velocity, 847.		

Model 800A

C.F.M. (70° Vol.) 2312 at 60° F. Entering Air Temperature

Motor: R.P.M., 1150 Brake H.P., .22

Temp. of entering air, °F.	Steam Press. 2 Lb. per Sq. In. Gage (219° F.)			Steam Press. 5 Lb. per Sq. In. Gage (228° F.)			Steam Press. 25 Lb. per Sq. In. Gage (267° F.)			Steam Press. 100 Lb. per Sq. In. Gage (338° F.)		
	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour
—20	194,000	46	201	201,500	48	210	233,500	60	254	293,000	79	332
0	174,000	61	180	181,000	64	189	212,500	75	231	270,000	95	306
20	154,000	77	160	160,500	79	167	191,500	91	208	247,000	111	281
40	135,000	92	140	141,500	95	147	172,000	106	186	225,500	127	257
60	117,000	107	121	123,000	110	129	153,000	121	166	205,000	142	234
70	108,500	114	112	115,000	117	120	144,000	129	156	196,000	150	223
80	100,000	122	104	106,500	124	111	135,000	136	146	187,000	158	212
100	83,500	136	87	90,000	139	94	118,000	151	128	168,500	173	191
120	68,000	151	71	74,500	153	78	102,000	165	111	152,000	188	172
	†Air delivery, 2472. ‡Air velocity, 827.			†Air delivery, 2484. ‡Air velocity, 831.			†Air delivery, 2534. ‡Air velocity, 848.			†Air delivery, 2628. ‡Air velocity, 879.		

*Data sheets covering all working pressures available upon request.
The Grinnell Thermolier is tested and rated in accordance with rules of the Industrial Unit Heater Manufacturers Association adopted Jan. 1930.
†Air delivery in cu. ft. per min. based on 60° F. entering air temperature.
‡Air velocity at exit in linear ft. per min. based on 60° F. entering air temperature and taken with louvers in wide open position; with louvers in 45° position, velocity increases approximately 35%.
Maximum working steam pressure, 125 lb.

CAPACITY TABLES FOR MODELS 1200-1200A-1600-1600A

*See Note below

Model 1200

C.F.M. (70° Vol.) 3075 at 60° F. Entering Air Temperature

Motor: R.P.M., 850 Brake H.P., .27

Temp. of entering air, °F.	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour
	Steam Press. 2 Lb. per Sq. In. Gage (219° F.)			Steam Press. 5 Lb. per Sq. In. Gage (228° F.)			Steam Press. 25 Lb. per Sq. In. Gage (267° F.)			Steam Press. 100 Lb. per Sq. In. Gage (338° F.)		
—20	500,000	107	517	517,000	112	540	601,000	133	651	753,000	171	854
0	445,000	118	461	463,000	123	483	544,000	144	589	690,000	182	783
20	390,000	129	405	409,000	133	426	487,000	155	527	627,000	193	712
40	340,000	139	352	358,000	143	373	433,000	165	470	569,000	205	647
60	294,000	148	304	311,000	153	324	384,000	175	416	516,000	215	586
70	272,000	153	281	289,000	158	301	360,000	180	390	491,000	220	558
80	251,000	158	258	267,000	163	278	338,000	185	365	466,000	225	530
100	208,000	168	216	224,000	172	234	294,000	195	317	418,000	235	476
120	169,000	177	175	183,000	182	192	252,000	204	273	374,000	245	426
	†Air delivery, 3528. ‡Air velocity, 676.			†Air delivery, 3558. ‡Air velocity, 681.			†Air delivery, 3680. ‡Air velocity, 704.			†Air delivery, 3917. ‡Air velocity, 748.		

Model 1200A

C.F.M. (70° Vol.) 3747 at 60° F. Entering Air Temperature

Motor: R.P.M., 850 Brake H.P., .27

Temp. of entering air, °F.	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour
	Steam Press. 2 Lb. per Sq. In. Gage (219° F.)			Steam Press. 5 Lb. per Sq. In. Gage (228° F.)			Steam Press. 25 Lb. per Sq. In. Gage (267° F.)			Steam Press. 100 Lb. per Sq. In. Gage (338° F.)		
—20	324,000	49	335	338,000	51	351	393,000	62	423	488,000	82	553
0	291,000	64	301	304,000	66	316	357,000	77	385	451,000	98	512
20	258,000	79	267	270,000	81	281	321,000	93	347	414,000	114	471
40	226,000	94	235	237,000	96	247	288,000	108	311	378,000	129	430
60	196,000	108	203	207,000	111	215	256,000	123	277	344,000	145	391
70	182,000	116	189	192,000	118	200	241,000	131	261	328,000	152	373
80	167,000	123	174	178,000	126	185	227,000	138	244	313,000	160	354
100	139,000	137	145	150,000	140	156	198,000	152	215	281,000	175	320
120	114,000	151	118	124,000	154	130	170,000	166	184	252,000	189	287
	†Air delivery, 4010. ‡Air velocity, 769.			†Air delivery, 4038. ‡Air velocity, 773.			†Air delivery, 4125. ‡Air velocity, 788.			†Air delivery, 4272. ‡Air velocity, 819.		

Model 1600

C.F.M. (70° Vol.) 4236 at 60° F. Entering Air Temperature

Motor: R.P.M., 1150 Brake H.P., .65

Temp. of entering air, °F.	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour
	Steam Press. 2 Lb. per Sq. In. Gage (219° F.)			Steam Press. 5 Lb. per Sq. In. Gage (228° F.)			Steam Press. 25 Lb. per Sq. In. Gage (267° F.)			Steam Press. 100 Lb. per Sq. In. Gage (338° F.)		
—20	617,000	93	639	633,000	97	661	725,000	117	799	910,000	150	1046
0	552,000	106	570	570,000	110	594	669,000	129	726	843,000	163	965
20	487,000	117	501	507,000	122	527	603,000	141	653	776,000	176	884
40	425,000	129	439	446,000	134	464	540,000	153	584	711,000	189	806
60	368,000	140	379	388,000	145	404	480,000	165	520	646,000	201	732
70	340,000	146	352	360,000	150	376	452,000	170	489	615,000	206	700
80	314,000	151	324	334,000	156	349	423,000	176	459	585,000	212	666
100	263,000	161	272	283,000	166	294	368,000	186	400	526,000	224	600
120	213,000	172	221	232,000	177	242	317,000	197	344	471,000	235	537
	†Air delivery, 4800. ‡Air velocity, 916.			†Air delivery, 4830. ‡Air velocity, 923.			†Air delivery, 4995. ‡Air velocity, 955.			†Air delivery, 5280. ‡Air velocity, 1010.		

Model 1600A

C.F.M. (70° Vol.) 5091 at 60° F. Entering Air Temperature

Motor: R.P.M., 1150 Brake H.P., .65

Temp. of entering air, °F.	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour	Total heat delivered, B.t.u. per hour	Exit air temp., °F.	Condensation, lb. per hour
	Steam Press. 2 Lb. per Sq. In. Gage (219° F.)			Steam Press. 5 Lb. per Sq. In. Gage (228° F.)			Steam Press. 25 Lb. per Sq. In. Gage (267° F.)			Steam Press. 100 Lb. per Sq. In. Gage (338° F.)		
—20	384,000	39	396	395,500	41	411	461,000	51	498	573,000	68	651
0	345,000	55	357	357,500	57	372	421,000	67	455	532,000	85	604
20	306,000	71	318	319,500	73	333	381,000	83	412	491,000	102	557
40	269,000	87	280	281,500	89	294	342,000	99	371	450,000	118	510
60	234,000	103	243	246,000	105	257	305,000	115	331	411,000	134	466
70	216,000	110	225	229,500	113	239	287,000	123	312	392,000	142	445
80	200,000	118	208	213,000	120	221	270,000	131	292	373,000	150	424
100	168,000	133	175	180,000	136	187	237,000	146	256	338,000	166	384
120	137,000	148	142	149,000	150	155	205,000	161	221	303,000	181	345
	†Air delivery, 5400. ‡Air velocity, 1034.			†Air delivery, 5428. ‡Air velocity, 1039.			†Air delivery, 5530. ‡Air velocity, 1058.			†Air delivery, 5705. ‡Air velocity, 1092.		

*Data sheets covering all working pressures are available upon request.
The Grinnell Thermolier is tested and rated in accordance with rules of the Industrial Unit Heater Manufacturers Association adopted Jan. 1930.
†Air delivery in cu. ft. per min. based on 60° F. entering air temperature.
‡Air velocity at exit in linear ft. per min. based on 60° F. entering air temperature and taken with louvers in wide open position; with louvers in 45° position, velocity increases approximately 45%.
Maximum working steam pressure, 125 lb.

TYPICAL CONNECTIONS FOR THERMOLIER

FOR Vacuum or Vented Return Gravity Systems

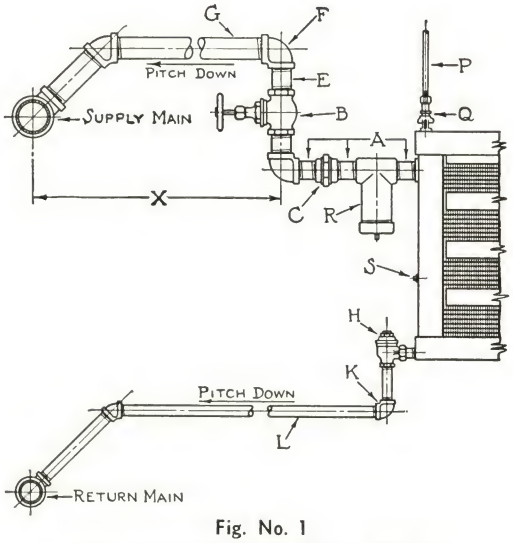


Fig. No. 1
For equipments where distance "X" is *less* than 10 feet

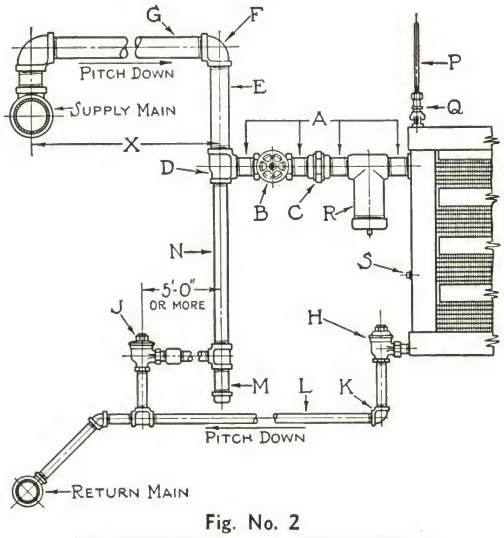


Fig. No. 2
For equipments where distance "X" is *more* than 10 feet

FOR Closed Return Gravity Systems

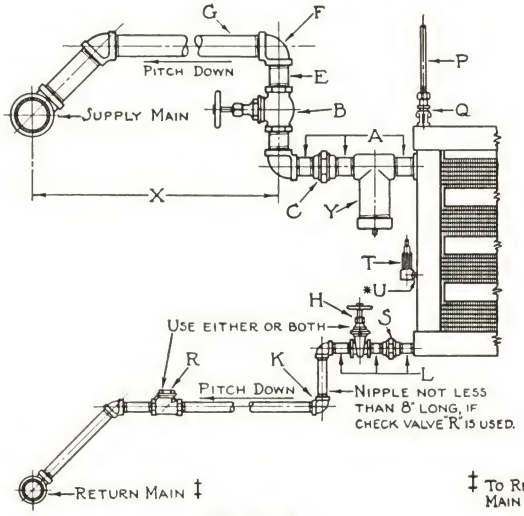


Fig. No. 3
For equipments where distance "X" is *less* than 10 feet

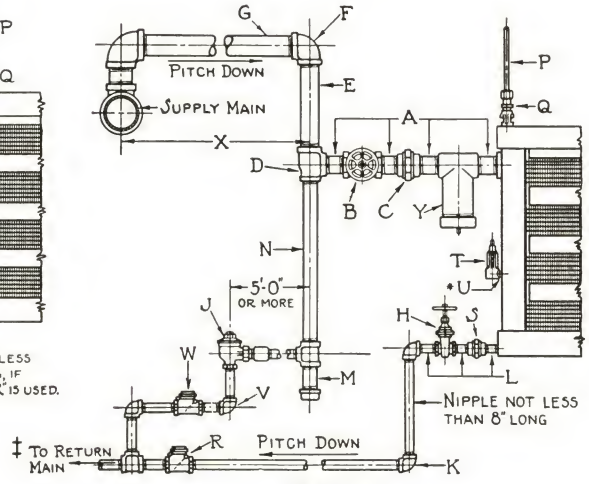
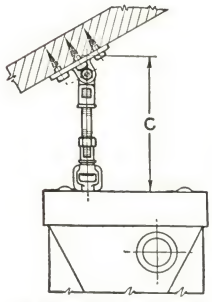


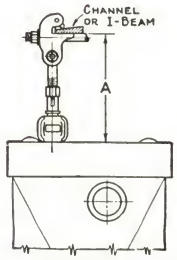
Fig. No. 4
For equipments where distance "X" is *more* than 10 feet

‡*Note:* Return mains or risers must be vented preferably at point where lines drop below water line of boiler.

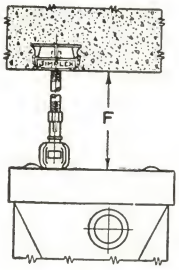
APPLICATION OF GRINNELL ADJUSTABLE HANGERS TO THERMOLIER



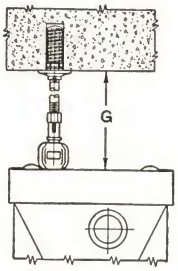
Adjustable Swinging Hanger Flange
*Fig. No. 155



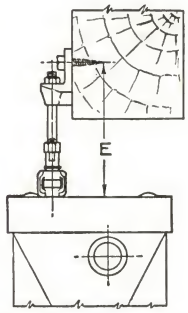
Universal Side I-Beam Clamp
*Fig. No. 225 with extension eye bolt Fig. No. 220



Simplex Insert
*Fig. No. 281



Expansion Case
*Fig. No. 117



Side Beam Bracket
*Fig. No. 202

Catalogue showing complete line of Grinnell Adjustable Hangers, with mechanical drawings and dimensions, sent upon request.

**Figure Numbers here as used in Grinnell Hanger Catalogue*


FOUNDED 1890